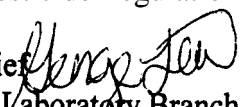


## Air Resources Board

John D. Dunlap, III, Chairman  
2020 L Street • Sacramento, California 95814 • [www.arb.ca.gov](http://www.arb.ca.gov)

### MEMORANDUM

TO: Douglas Y. Okumura, Chief  
Environmental Monitoring and  
Pest Management Branch  
Department of Pesticide Regulation

FROM: George Lew, Chief   
Engineering and Laboratory Branch  
Monitoring and Laboratory Division

DATE: April 13, 1998

SUBJECT: FINAL REPORT FOR THE 1996 CHORPYRIFOS MONITORING IN  
TULARE COUNTY

---

Attached is the **final** "Report for the Application and Ambient Air Monitoring of Chlorpyrifos (and the **oxon** analogue) in Tulare County During Spring/Summer, 1996." This report contains revisions suggested by your staff which were provided in your March 3, 1998 memorandum.

These results are intended for identifying the presence of chlorpyrifos in ambient air. Additional air monitoring near the use of chlorpyrifos may be necessary to determine if there is a need for mitigation.

If you or your staff have questions or need further information, please contact me at (916) 263-1630 or Mr. Kevin Mongar at (916) 263-2063.

#### Attachment

cc: Ray Menebroker, SSD w/Attachment  
William **Appleby**, Tulare County Agricultural Commissioner's Office  
David L. Crow, SJVUAPCD  
Sharon Seidel, OEHHA w/Attachment  
Mike McLean, McLean Spray Company  
Roger Sava, DPR w/Attachment

State of California  
California Environmental Protection Agency  
AIR RESOURCES BOARD

**Report for the Application and Ambient Air Monitoring  
of Chlorpyrifos (and the oxon analogue)  
in Tulare County During Spring/Summer, 1996**

Engineering and Laboratory Branch

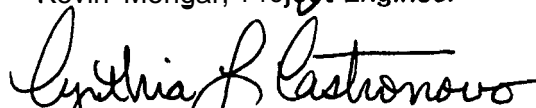
Monitoring and Laboratory Division

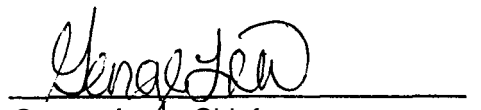
Project No. C96-041 (Ambient)  
C96-040 (Application)

Date: April 7, 1998

APPROVED:

  
Kevin Mongar, Project Engineer

  
Cynthia L. Castronovo, Manager  
Testing Section

  
George Lew, Chief  
Engineering and Laboratory Branch

This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

## Summary

### Report for the Application and Ambient Air Monitoring of Chlorpyrifos (and the **oxon** analogue) in Tulare County During Spring/Summer, 1996

This report presents the results of application and ambient air monitoring in Tulare County for chlorpyrifos and its **oxon** degradation product during the peak use period of May and June. Monitoring was conducted to coincide with the use of chlorpyrifos as an insecticide on oranges for the control of lepidopterous pests and scale. Summaries of application and ambient sample results are reported in Tables 5 and 8.

All of the application samples, including background samples, were found to be above the limit of quantitation (LOQ) of 0.20 ug per sample for both chlorpyrifos and chlorpyrifos **oxon**. The average result for the three background samples was 1.44  $\text{ug}/\text{m}^3$  for chlorpyrifos and 0.07  $\text{ug}/\text{m}^3$  for chlorpyrifos **oxon**. The trip blank sample was below the LOQ for both compounds. The highest chlorpyrifos value, 47.2  $\text{ug}/\text{m}^3$ , was observed at the east sampling site during the 2nd sampling period (+ 1.75 hours). The result for the collocated east sample though, which was 14.7  $\text{ug}/\text{m}^3$  for the same period, was significantly lower. Thus, the results of these collocated samples indicates a sampling problem (e.g., contamination, flow blockage, etc.; the exact nature cannot be determined) at the east position during this sampling period. The next highest chlorpyrifos value, 27.7  $\text{ug}/\text{m}^3$ , was observed at the north sampling site during the 5th sampling period (second 8.5 hours). The highest chlorpyrifos **oxon** value, 3.01  $\text{ug}/\text{m}^3$ , was observed at the east sampling site during the 2nd sampling period (+ 1.75 hours). Again, the result for the collocated east sample, which was 1.76  $\text{ug}/\text{m}^3$  for the same period, was significantly lower. The next highest chlorpyrifos **oxon** value, 1.90  $\text{ug}/\text{m}^3$ , was observed at the east sampling site during the 4th sampling period (first 8.5 hours). The collocated sample result for the same period, 1.85  $\text{ug}/\text{m}^3$ , was very close.

For chlorpyrifos, of the 103 ambient samples collected (spikes, blanks and collocated samples excluded), 76 were found to be above the LOQ of 0.20 ug chlorpyrifos per sample (0.0094  $\text{ug}/\text{m}^3$  or 0.66 pptv for a 24-hour sample). Five of the 21 samples (excluding collocated samples) collected at the urban background (ARB) site had chlorpyrifos results above the LOQ, of which the highest was 0.039  $\text{ug}/\text{m}^3$ . The highest value observed for the study was 0.815  $\text{ug}/\text{m}^3$  at the Sunnyside Union Elementary School in Strathmore on June 13, 1996. For chlorpyrifos **oxon**, 72 of the samples were found to be above the LOQ of 0.20 ug chlorpyrifos **oxon** per sample (0.0094  $\text{ug}/\text{m}^3$  or 0.69 pptv). Five of the 21 samples (excluding collocated samples) collected at the urban background (ARB) site had chlorpyrifos results above the LOQ, of which the highest was 0.060  $\text{ug}/\text{m}^3$ . The highest value observed for the study was 0.23  $\text{ug}/\text{m}^3$  at the Kaweah High School in Exeter on June 13, 1996.

## Acknowledgments

Neil Adler, Don Fitzell and Eric Lapurga of the ARB Testing Section staff conducted equipment preparation and field sample collection. **Cara Roderick** and Lynn Baker of the ARB Stationary Source Division assisted with review and comment on the sampling protocol and monitoring report. Steve Nunn of the ARB Quality Management and Operation Support Branch provided quality assurance support. Bill **Appleby** of the Tulare County Agricultural Commissioner's Office provided information regarding current regional use of chlorpyrifos. Dave Kim of the DPR provided meteorological station monitoring for the application study. Chemical analyses were performed by the Trace Analytical Laboratory of the Department of Environmental Toxicology at U.C. Davis.

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Report for the Application and Ambient Air Monitoring  
of Chlorpyrifos (and the **oxon** analogue)  
in Tulare County During Spring/Summer, 1996

I. Introduction

At the request of the California Department of Pesticide Regulation (**DPR**) (April 28, 1995 memo, Sanders to Shiroma), the Air Resources Board (ARB) staff determined airborne concentrations of the pesticide chlorpyrifos (Lorsban", Dursban"). As per an April 19, 1996 memorandum from John Sanders to George Lew, monitoring for chlorpyrifos **oxon**, a degradation product of chlorpyrifos, was simultaneously conducted. Monitoring was conducted over a five week ambient program in populated areas of Tulare County and over a 72 hour application program also in Tulare County. This monitoring was done to fulfill the requirements of AB 1807/3219 (Food and Agricultural Code, Division 7, Chapter 3, Article 1.5) which requires the ARB "to document the level of airborne emissions . . . of pesticides which may be determined to pose a present or potential hazard..." when requested by the DPR.

The sampling protocol, "Protocol for the Application and Ambient Air Monitoring of Chlorpyrifos (and the **oxon** analogue) in Tulare County During Summer, 1996", is enclosed as Appendix I in a separate volume of appendices to this report.

The University of California, Davis, Trace Analytical Laboratory (**UCD-TAL**) report, "Method Development, Ambient Site and Application Site Monitoring for Chlorpyrifos and Chlorpyrifos **Oxon** in Air Samples Using XAD-4 Resin as a Trapping Medium," is enclosed as Appendix II in the separate volume of appendices. The method development results **and** sampling/analysis Standard Operating Procedures submitted by the UCD and the **oxon** analogue are included in the above report.

The Quality Management and Operations Support Branch report, "Chlorpyrifos **QA** System Audit Report", is enclosed as Appendix III in the separate volume of appendices.

The Pesticide Control Advisor's (PCA) application recommendations are enclosed as Appendix IV in the separate volume of appendices.

The **DPR's** April 28, 1995 memorandum, "Monitoring Recommendations for Chlorpyrifos", is enclosed as Appendix V in the separate volume of appendices.

The application and ambient field log sheets are enclosed as Appendix VI in the separate volume of appendices.

The meteorological monitoring results are enclosed as Appendix VII in the separate volume of appendices.

## II. Chemical Properties of Chlorpyrifos

The following information regarding the chemical properties of chlorpyrifos was obtained from the DPR's April 28, 1995 "Monitoring Recommendation for Chlorpyrifos" (Appendix V).

Technical chlorpyrifos [O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate] is a crystal, white to amber in color, with a mild mercaptan-like odor. Chlorpyrifos has a molecular weight of 350.59 g/mole and a specific density of 1.398 at 43.5°C. It has a water solubility of 450, 730, and 1,300 µg/L at 10, 20, and 30°C respectively, a Henry's constant of  $4.16 \times 10^{-6}$  atm-mol/m<sup>3</sup> at 25 °C, and a vapor pressure of  $1.7 \times 10^{-5}$  mmHg at 25°C. The half-life ( $t_{1/2}$ ) of chlorpyrifos in several environmental compartments is: 1) Soil  $t_{1/2}$  varies from 12 weeks to 1 day depending on soil type and soil temperature; 2) Surface water (estuarine)  $t_{1/2}$  24 days; and 3) Surface water (fresh, 25°C)  $t_{1/2}$  varies from 120 days (pH 6.1) to 53 days (pH 7.4). Photolytic  $t_{1/2}$  in fresh water at 40°N latitude (depth 10<sup>-3</sup> cm) is reported as 31 days during midsummer and 345 days in midwinter. Increasing the depth to 1 meter increased photolytic  $t_{1/2}$  to 2.7 years.

The acute oral LD<sub>50</sub> of chlorpyrifos for male and female rats is 163 and 135 mg/kg respectively. The LC<sub>50</sub> (96 hour) for rainbow trout is 3 µg/L, for bluegill sunfish 2.6 µg/L, and for an estuarine mysid 0.035 µg/L. The OSHA 8-hour time weighted average for personal exposure limit is 0.2 mg/m<sup>3</sup>. Chlorpyrifos has entered the risk assessment process at DPR under the SB 950 (Birth Defect Prevention Act of 1984) based on its mutagenicity and on its relatively low NOEL (No-Observed-Effect-Level).

## III. Sampling

A sketch of the sampling apparatus is shown in Figure 1 of Appendix I (page 7 of appendices ). Samples were collected by passing a measured volume of ambient air through XAD-4 resin. The resin holders are 4-3/4" long x 1-55/66" O.D. and made of Teflon. Each holder contained approximately 30cc of specially prepared XAD-4 resin provided by UCD-TAL. The resin was held in place by stainless steel screens between Teflon support rings. Calibrated rotameter were used to set and measure sample flow rates. The sampling system was operated continuously over the sampling period with the exact operating interval noted. The flow rates used were 14.5 and 14.7 liters per minute (Lpm) for the application and ambient monitoring respectively. Samplers were leak checked prior to and after each sampling period with the sampling cartridges installed. Any change in the flow rates was recorded in the field log book. To block sunlight, the resin holders were covered with aluminum foil during the sampling periods. At the end of each sampling period the holders were capped and placed in a zip-lock plastic bag with an identification label affixed. The field log book was used to record start and stop times, sample identifications and any other significant comments. Subsequent to sampling, the sample holders were transported on dry ice, as soon as was reasonably possible, to the UCD-TAL for sample recovery and analysis. The samples were stored in the freezer (-20 °C) or analyzed immediately.



## A. Application Monitoring

The use pattern for chlorpyrifos suggested that application-site monitoring should be conducted during the months of May, June, or July in Tulare County, and that the application be associated with oranges. A three day monitoring period was to be established with intended sampling times as follows; (where the first sample is started at the start of application) application + 1 hour, followed by one 2-hour sample, one 4-hour sample, two **8-hour** samples and two 24-hour samples. Information collected included: 1) the elevation of each sampling station with respect to the field, 2) the orientation of the field with respect to North (identified as either geographic or magnetic), 3) an accurate record of the positions of the monitoring equipment with respect to the field, including the distance each monitor is positioned away from the edge of the field and an accurate drawing of the monitoring site showing the precise location of the monitoring equipment and any wind obstacles with respect to the field, 4) the field size, 5) the application rate, 6) formulation and 7) method and length of application.

A 60 acre orange orchard, refer to Figure 2 for a diagram, was chosen for the application monitoring site. Refer to Appendix IV (appendices page 105) for a copy of the Pesticide Control Advisor's "Application Recommendations". Details regarding the site and application are summarized in Table 1.

---

TABLE 1. Application Information

County/Section/Township/Range:	<b>Tulare/18/17S/26E</b>
Product Applied:	<b>Lorsban® 4E (4 pounds chlorpyrifos <b>A.I./gallon</b>)</b>
Type of Application Equipment:	Ground-rig blower
Application Rate:	1.5 gallons <b>Lorsban®</b> /acre in 750 gallons water
Applicator:	McLean Spray Company, Visalia, CA.

---

The 60 acres was split into two blocks; Block 24 was approximately 20 acres and block 25 was approximately 40 acres. The application was started the morning of June 4 but the 60 acres were not finished until on the morning of June 5. The June 4, 1996 application started at 0630 and was stopped at 1030 due to increasing wind/temperature. Referring to Figure 2, three spray rigs were in operation in Block 25 with the rows oriented east/west while one worked in Block 24 with the rows oriented north/south. The application in Block 25 started at the southeast side and finished for the day at row 37 (counting south to north). The application in Block 24 started at the southwest side and finished for the day at row **18** (counting west to east). The June 5, 1996 application was started at 0430 and was finished at 1030. Table 2 lists the actual application sampling periods.

---

TABLE 2. Application Sampling Periods

<u>Period</u>			
B	background	6/3-4/96	2100 to 0600
1	application plus 1 hour	6/4/96	0600 to 1130
2	1.75 hour	6/4/96	1130 to 1315
3	4.25 hour	6/4/96	1315 to 1730
4	8.5 hour	6/4-5/96	1730 to 0400
5	8.5 hour	6/5/96	0400 to 1235
6	17.25 hour	6/5-6/96	1235 to 0600
7	24 hour	6/6-7/96	0600 to 0600

---

Four samplers were initially positioned, one on each side of the field. A fifth sampler was collocated at the east position. Prior to the application, background samples were taken at each position to establish if any chlorpyrifos was detectable in the air before the application (i.e., from nearby applications). During collection of the background samples, the sampling train located at the west position was stolen. This west position was along a well traveled County road. The stolen sampler was not replaced due to the concern of losing additional equipment. Thus, samples were collected only at the north, east and south sites for this study. The north, east and south samplers were positioned approximately 19 yards, 14 yards and 10 yards from the field respectively. The north and east samples were at the same elevation as the field while the south sampler was positioned on a levee approximately 10 feet above the field. The meteorological station was positioned approximately 15 yards north of the east sampling station.

The meteorological station was supplied and set up by DPR staff to determine wind speed and direction, relative humidity and air temperature. This station continued to operate continuously throughout the sampling period collecting data at 1 minute intervals using a data logger. Appendix VII lists the meteorological station data at 15 minute intervals for the approximately 72 hour test period. The data is also available on a 3.5 inch high density diskette. ARB staff noted the degree of cloud cover at the start of application and whenever sample cartridges were changed. The skies were clear during the entire application monitoring program.

#### B. Ambient Monitoring

The use patterns for chlorpyrifos suggested that ambient monitoring should take place in Tulare County during a 30- to 45-day sampling period in the months of May, June, or July. Actual monitoring took place from May 28, 1996 to June 30, 1996. Four sampling sites were selected in areas of Tulare County frequented by people and where citrus farming is predominant. Background samples were collected in an area distant to chlorpyrifos applications. Replicate (collocated) samples were collected for five dates at each sampling location. The five sites were at the locations listed in Table 3.

TABLE 3. Ambient Sampling Sites		
<b>S</b>	Sunnyside Union Elementary School 21644 Avenue 196, Strathmore, CA 93267 Section/Township/Range: 3 1/20/27	Gale Gregory, Dist. Sup. (209) 568-1 741
<b>J</b>	Jefferson Elementary School 333 Westwood Avenue, Lindsay, CA 93247 Section/Township/Range: 1/20/26	Ken Stovall (209) 562-6303
<b>K</b>	Kaweah School, Exeter School District Transportation and Maintenance Yard 1105 E. Rocky Hill Dr., Exeter, CA 93221 Section Township/Range: 11/1 9/26	Lowell Hicks (209) 592-942 1
<b>UC</b>	University of California, Lindcove Field Station Super. 22963 Carson Avenue, Exeter, CA 93221 Township/Range/Section: 16/1 8/27	Louis Whitendale, Station (209) 592-2408
<b>ARB</b>	Air Resources Board, Ambient Air Monitoring Station 310 N. Church Street, Visalia, CA (Background Site) Township/Range/Section: 30/1 8/25	Pete Ouchida (916) 322-3719

Sunnyside Union Elementary School is situated in a sparsely populated area of Strathmore with oranges groves “across the street” on the north, west and east and olives on the south side. The sampling unit was placed on the roof of one of the classroom buildings which are all single story.

Jefferson Elementary School is located near the edge of a residential area just to the east of Highway 65 in Lindsay. The sampling unit was placed on the roof of one of the classroom buildings which are all single story. There were residential areas directly to the east and south, commercial buildings to the north and bare land to the west. There were no orange groves directly “across the street” but there were oranges several hundred yards to the southeast and to the west on the other side of Highway 65.

The Kaweah School/Exeter School District transportation and maintenance yard is located just east of Highway 65 on Rocky Hill Road in Exeter. The sampling equipment was placed on the roof of a shop building in the bus yard. There is a grove of oranges approximately 100 yards to the east of the sampling site.

The fourth sampling site was located at the University of California, Lindcove Field Station. The site is located at the edge of the foothills just west of Highway 198. A variety of citrus trees are planted at the field station. Other orange orchards are located throughout the surrounding area. There were no accessible roof tops at this site for the sampling equipment. An open area near the middle of the field station was selected where an existing meteorological station is positioned.

The background monitoring was conducted at the ARB Monitoring Station in downtown Visalia. The sampling apparatus was placed on a second story roof near the other ARB monitoring equipment. No orange groves are located near the downtown area of Visalia where the background monitoring site was set-up.

The samples were collected by ARB personnel over a five week period from May 28 - June 28, 1996. Twenty-four hour samples were taken Monday through Friday (4 samples/week) at a flow rate of 14.7 liters per minute.

#### IV. Analytical Methodology Summary

Samples are extracted with 75 mL of ethyl acetate on a rotating platform shaker for at least 1 hour. One-half (37.5 mL) of the original extract is measured out using a 50 mL graduated cylinder and transferred quantitatively into a 100 mL round bottom flask. The sample is evaporated to near dryness, and quantitatively transferred to a hematocrit tube with ethyl acetate (2 mL final volume). All samples are then analyzed directly for chlorpyrifos using a gas chromatography method with a flame photometric detector, using a 526 nm filter for phosphorus detection. Each set of samples that is worked up includes a control resin blank and three fortified resin blanks. Ambient and application samples that contain residues of chlorpyrifos and/or its **oxon** breakdown product are confirmed either by electrolytic conductivity detector and/or mass selective detector operated in selective ion monitoring mode. The analyses were conducted under contract by staff at the Trace Analysis Laboratory, Department of Environmental Toxicology, UC Davis (UCD-TAL). All samples were stored in an ice chest containing dry ice or a freezer until analysis.

**Optional Column Clean Up Procedure:** In the advent of interferences a column cleanup procedure and/or a Hall detector is used. (Mourer et al, J. Assoc of Anal. Chem Vol 73, 2, 1990). Clean up, when necessary, is accomplished using a Florisil column. Concentrated extracts are taken to dryness using a rotary evaporator and brought up in 5 mL of hexane and eluted from a Florisil column with 50 mL of a 5% diethyl ether in hexane solution. Samples are concentrated using a rotary evaporator and the final volume is adjusted to facilitate analysis.

#### V. Application and Ambient Results

Quality assurance results are discussed below in Section VII.

Sample results above the LOQ, 0.20 ug per sample for chlorpyrifos and chlorpyrifos **oxon**, are reported in Tables 4 through 9. The UCD-TAL determined the **LOQ** based on "the minimum concentration injected that can be consistently quantitated". This UCD-TAL **LOQ** is a conservative estimate relative to the ARB, Testing Section calculation. Using the data submitted in the SOP (page 79 of appendices, Table 1) and the Testing Section equation ( $LOD = X_{intercept} + 3(SD)$ ;  $LOQ = 3.3 \times LOD$ ) the **LOQ** result would be 0.068 ug per sample for chlorpyrifos and 0.113 ug per sample for chlorpyrifos **oxon**. The UCD-TAL did not report a specific LOD or any results below their estimated LOQ.

Table 4 lists the application results in units of  $\mu\text{g}/\text{m}^3$  and ppbv. Table 7 lists the ambient results in units of  $\text{ng}/\text{m}^3$  and pptv. The equations used to convert to the volume/volume units at 1 atmosphere and 25 °C are;  $\text{ppbv} = (\mu\text{g}/\text{m}^3) \times (1/1000) \times (24.46/\text{Molecular Weight})$ , and  $\text{pptv} = (\text{ng}/\text{m}^3) \times (24.46/\text{Molecular Weight})$ .

#### A. Application Results

The results of the application monitoring are provided in Table 4 and are summarized in Table 5. The application monitoring results for chlorpyrifos are also summarized, in Figure 3, as associated with the “wind rose” for each sampling period. The “spokes” of the wind roses correspond to the compass direction of origin of the wind. For example, the wind was predominantly from the southeast during the background sampling period. The segments of each spoke correspond to incremental increases in wind speed of 2 mph each. The length of the spoke (and each segment) corresponds to the portion of the sampling time that the wind was from that direction (at that velocity).

All of the application samples, including background samples, were found to be above the LOQ of 0.20  $\mu\text{g}$  per sample for both chlorpyrifos and chlorpyrifos **oxon**. The average result for the three background samples was 1.44  $\mu\text{g}/\text{m}^3$  for chlorpyrifos and 0.07  $\mu\text{g}/\text{m}^3$  for chlorpyrifos **oxon**. The trip blank sample was below the LOQ for both compounds. The highest chlorpyrifos value, 47.2  $\mu\text{g}/\text{m}^3$ , was observed at the east sampling site during the 2nd sampling period (+ 1.75 hours). The result for the collocated east sample though, which was 14.7  $\mu\text{g}/\text{m}^3$  for the same period, was significantly lower. Thus, the results of these collocated samples indicates a sampling problem (e.g., contamination, flow blockage, etc.; the exact nature cannot be determined) at the east position during this sampling period. The next highest chlorpyrifos value, 27.7  $\mu\text{g}/\text{m}^3$ , was observed at the north sampling site during the 5th sampling period (second 8.5 hour). The highest chlorpyrifos **oxon** value, 3.01  $\mu\text{g}/\text{m}^3$ , was observed at the east sampling site during the 2nd sampling period (+ 1.75 hours). Again, the result for the collocated east sample, which was 1.76  $\mu\text{g}/\text{m}^3$  for the same period, was significantly lower. The next highest chlorpyrifos **oxon** value, 1.90  $\mu\text{g}/\text{m}^3$ , was observed at the east sampling site during the 4th sampling period (first 8.5 hour) . The collocated sample result for the same period, 1.85  $\mu\text{g}/\text{m}^3$ , was very close.

#### B. Ambient Results

The results of the ambient monitoring are provided in Table 7 and are summarized in Table 8. For chlorpyrifos, of the 103 ambient samples taken (spikes, blanks and collocated samples excluded), 76 were found to be above the LOQ of 0.20  $\mu\text{g}$  per sample (0.0094  $\mu\text{g}/\text{m}^3$  or 0.66 pptv for a 24-hour sample). Five of the 21 samples (excluding collocated samples) collected at the urban background (ARB) site had chlorpyrifos results above the LOQ, of which the highest was 0.039  $\mu\text{g}/\text{m}^3$ . The highest chlorpyrifos value observed for the study was 0.815  $\mu\text{g}/\text{m}^3$  at the Sunnyside Union Elementary School on June 13, 1996. For chlorpyrifos **oxon**, 72 were found to be above the LOQ of 0.20  $\mu\text{g}$  per sample (0.0094  $\mu\text{g}/\text{m}^3$  or 0.69 pptv for a 24-hour sample). Six of the 21 samples collected at the urban background (ARB) site had chlorpyrifos **oxon** results above the LOQ, of which the highest was 0.060  $\mu\text{g}/\text{m}^3$ . The highest value observed for the study was 0.230  $\mu\text{g}/\text{m}^3$  at the

Kaweah School transportation and maintenance yard on June 13, 1996.

## VI. Quality Assurance

Field quality control (QC) for the application monitoring included: 1) four trip spikes prepared by the ARB staff, 2) collocated samples collected at one of the four sampling sites, 3) a trip blank, and 4) background samples. DPR's April 28, 1995 memo, "Monitoring Recommendation for Chlorpyrifos", stated that "Field blank and field spike samples should be collected at the same environmental (temperature, humidity, exposure to sunlight) and experimental (similar air flow rates) conditions as those occurring at the time of sampling." For this application study we were not able to collect actual field spike samples (e.g., collocated with a background sample) but did collect trip spike samples. The background samples were collected at the same environmental and experimental conditions as those occurring at the time of sampling (except for total sample volume). However, no "field blanks" were collected. Collection of true field blanks would involve rather complicated procedures and is not practical under field conditions (e.g., a supply of "blank gas" at 15 Lpm for up to 24 hours). The trip blank was collected at the time of the sampling but did not experience the same environmental and experimental conditions except for transport and storage.

Field QC for the ambient monitoring included: 1) four field spikes collected under the same environmental and experimental conditions as those occurring at the time of ambient sampling; the field spikes were obtained by sampling ambient air at the background (collocated with an ambient "ARB" sample); 2) four trip spikes; 3) four lab-freezer spikes; 4) a "field spike" blank, a "trip spike" blank and a "lab spike" blank; these blanks were un-spiked blank cartridges which were exposed to the same conditions as the respective spikes; 5) collocated samples taken for five dates at each sampling location; and 6) trip blanks collected one per week (see comment above regarding field blanks).

The instrument dependent parameters such as reproducibility, linearity and limit of quantitation are discussed in the UCD-TAL analysis report (appendices pg. 25). A chain of custody sheet accompanied all samples. Rotameters were calibrated as outlined in the "Quality Assurance Plan for Pesticide Monitoring" (appendices pg. 8). Results of the flow audit are listed in Appendix III, "Chlorpyrifos QA System Audit Report" (appendices pg. 93). The application and ambient field log sheets are listed in Appendix VI (appendices pg. 111).

## VII. Quality Assurance Results

### A. Method Development

Refer to Appendix II, "Method Development, Ambient Site and Application Site Monitoring for Chlorpyrifos and Chlorpyrifos Oxon in Air Samples Using XAD-4 Resin as a Trapping Medium", for discussion and results of method development studies. The method development results indicate that conversion of chlorpyrifos to the oxon analogue may take place on the trapping media during sampling. This conversion is probably enhanced as the ambient temperature increases. The extent of conversion under variable temperature and

light conditions has not been resolved by this study. However, the UCD-TAL field spike results showed only insignificant conversion taking place under actual field conditions. The potential for conversion during sampling should be more fully investigated before conducting further monitoring studies.

#### **B. Trio Blanks**

All ambient and application trip blank results were less than the LOQ of 0.20 ug/sample for chlorpyrifos and chlorpyrifos oxon.

#### **C. Application Background Sample Results**

The three application background samples had chlorpyrifos values of 1.57, 2.07 and 0.69 ug/m<sup>3</sup>. These background results were all higher than the highest value observed during the five week ambient monitoring study. These results indicate that other applications of chlorpyrifos had occurred in the nearby vicinity just prior to this monitoring study.

#### **D. Collocated Sample Results**

The results of application and ambient collocated samples are listed in Table 6 and Table 9 respectively. The relative difference (RD = difference/average x 100) is listed for both chlorpyrifos and chlorpyrifos oxon. There are no established acceptance criteria for collocated samples for this program. Generally though, relative difference results of up to 40% (i.e., the average  $\pm$  20%) are reasonable.

For the application study, seven pairs of collocated samples were collected. For chlorpyrifos, five pairs had a relative difference of less than 40%, and the remaining two pairs had relative differences of 63% and 105%. For chlorpyrifos oxon, six pairs had a relative difference of less than 40% and the remaining pair had a relative difference of 52%.

For the ambient study, twenty-five pairs of collocated samples were collected. For chlorpyrifos, five of the pairs were below the LOQ, one pair had one value below and the other above the LOQ, sixteen pairs had a relative difference of less than 40%, and the remaining three pairs had relative differences 40% and 79%. For chlorpyrifos oxon, six of the pairs were below the LOQ, two of the pairs had one value below and the other slightly above the LOQ, sixteen pairs had a relative difference of less than 40%, and the remaining pair had a relative difference of 44%.

#### **E. Laboratory Spikes**

Laboratory spikes are normally prepared at the same time and at the same level as the trip spike and field spike sets. The laboratory spikes are kept in a freezer until extraction and analysis. The extraction and analysis of laboratory, trip and field spikes normally occurs at the same time. Laboratory spike sets for the ambient study were prepared by QMOSB staff. No laboratory spikes were prepared for the application study.

### 1) QMOSB Laboratory Spikes

The results of a first set of ambient laboratory spike samples were invalidated by the QMOSB due to possible low level resin contamination for chlorpyrifos. Refer to Appendix III (appendices pg. 97) for a discussion of these sample results. Another set of nine laboratory spikes (plus a "lab spike" blank) was prepared using a different batch of XAD-4 resin and the results are listed in Table 10. The average recovery of chlorpyrifos was 103% and the average recovery of chlorpyrifos **oxon** was 109%. These results indicate that the sample storage and analytical procedures used in this study produce acceptable results for chlorpyrifos and chlorpyrifos **oxon**.

### F. Trip Spikes

Trip spikes are normally prepared at the same time and at the same level as the laboratory spike and field spike sets. The trip spikes are kept in a freezer until transported to the field and then are kept on dry ice in an ice chest (the same one used for samples) during transport to and from the field and at all times while in the field except for trip spike sample log-in and labeling. Trip spikes for the ambient study were prepared by QMOSB staff and trip spikes for the application study were prepared by ELB staff.

#### 1) QMOSB Ambient Trip Spikes

The results of the ambient trip spike samples were invalidated by the QMOSB due to possible low level resin contamination for chlorpyrifos. Refer to Appendix III (appendices pg. 95) for a discussion of these sample results.

#### 2) ELB Application Trip Spikes

The results of three application trip spikes (plus a "trip spike" blank) prepared by ELB staff are listed in Table 11. These spike samples were fortified with both chlorpyrifos and chlorpyrifos **oxon** at levels from 25 ug to 500 ug. The average recovery of chlorpyrifos was 98.6% and the average recovery of chlorpyrifos **oxon** was 99.0%. These results indicate that the sample transport, storage and analytical procedures used in this study produce acceptable results for chlorpyrifos and chlorpyrifos **oxon**.

### G. Field Spikes

Field spikes are prepared at the same time and at the same level as the laboratory spike and trip spike sets. The field spikes are kept in a freezer until transported to the field and then are kept on dry ice in an ice chest (the same one used for samples) during transport to and from the field and at all times while in the field except for the sampling period. Field spikes were collected at the same environmental and experimental conditions as those occurring at the time of ambient sampling. The ambient field spikes were obtained by sampling air, through a previously spiked cartridge, at the background monitoring site (i.e., collocated with an ambient background sample). Field spike sets for the ambient study were prepared by both QMOSB staff and TAL staff. No field spikes were collected for the application study.



#### 1) QMOSB Field Spikes

The results of the ambient field spike samples were invalidated by the QMOSB due to possible low level resin contamination for chlorpyrifos. Refer to Appendix III (appendices pg. 96) for a discussion of these sample results.

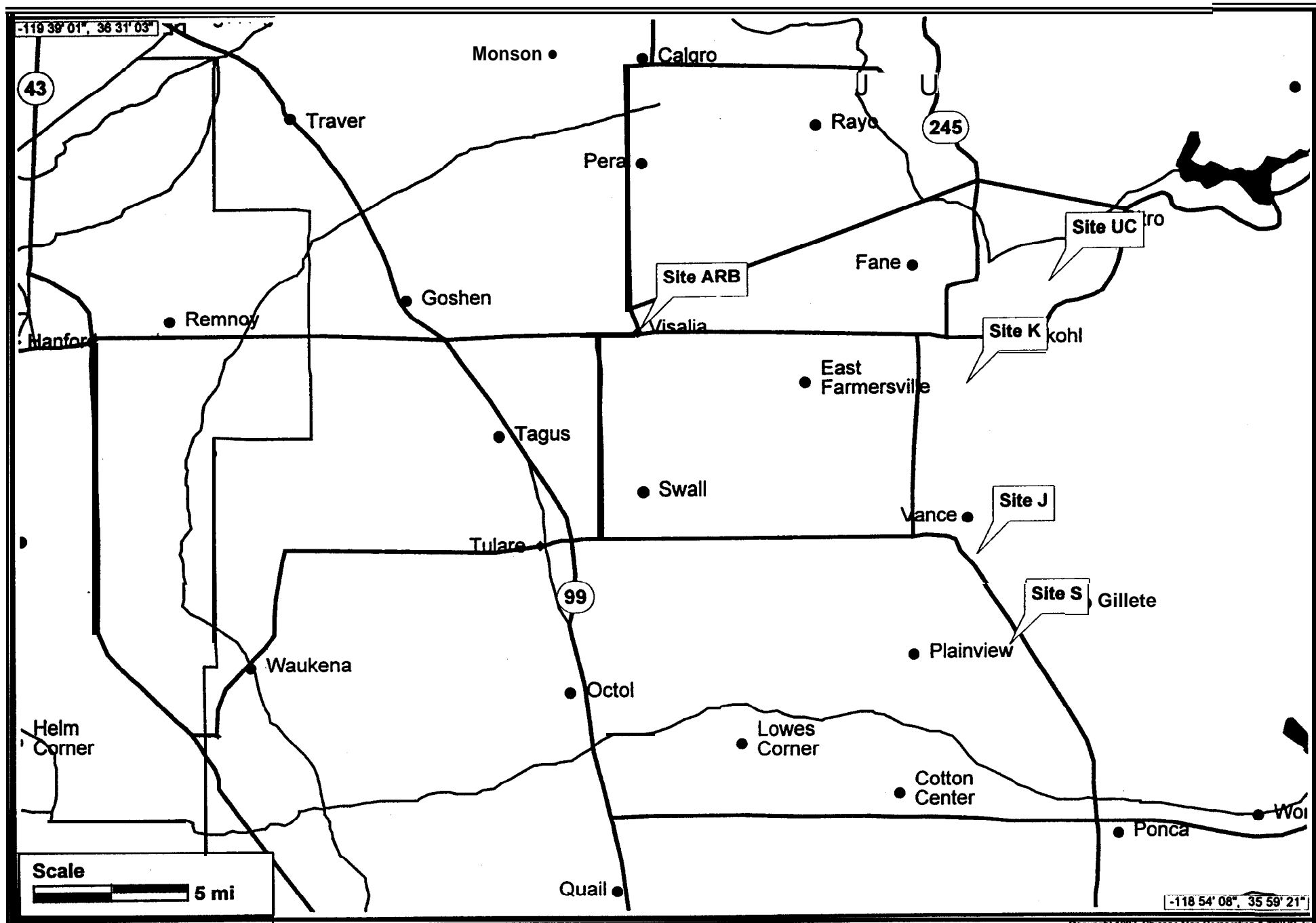
#### 2) UCD-TAL Field Spikes

The results of the five ambient field spikes prepared by staff of the UCD-TAL are listed in Table 12. These field spikes were prepared and collected as part of the **TAL's** method development process and were fortified only with chlorpyrifos (no **oxon**) at a level of 50 ug each. The average recovery of chlorpyrifos was 94% with the range from 90% to 104%. An average percent conversion to the corresponding **oxon** of 2% was observed. The chlorpyrifos recovery listed above was not corrected by summation of "parent plus product". These results indicate that the sampling, sample transport and storage, and analytical procedures used in this study produce accurate air concentration results for chlorpyrifos and chlorpyrifos **oxon**. In addition, these results indicate that there was minimal degradation of chlorpyrifos to **chlorpyrifos-oxon** on the sampling cartridge under field conditions.

#### H. Resin Blank Analyses

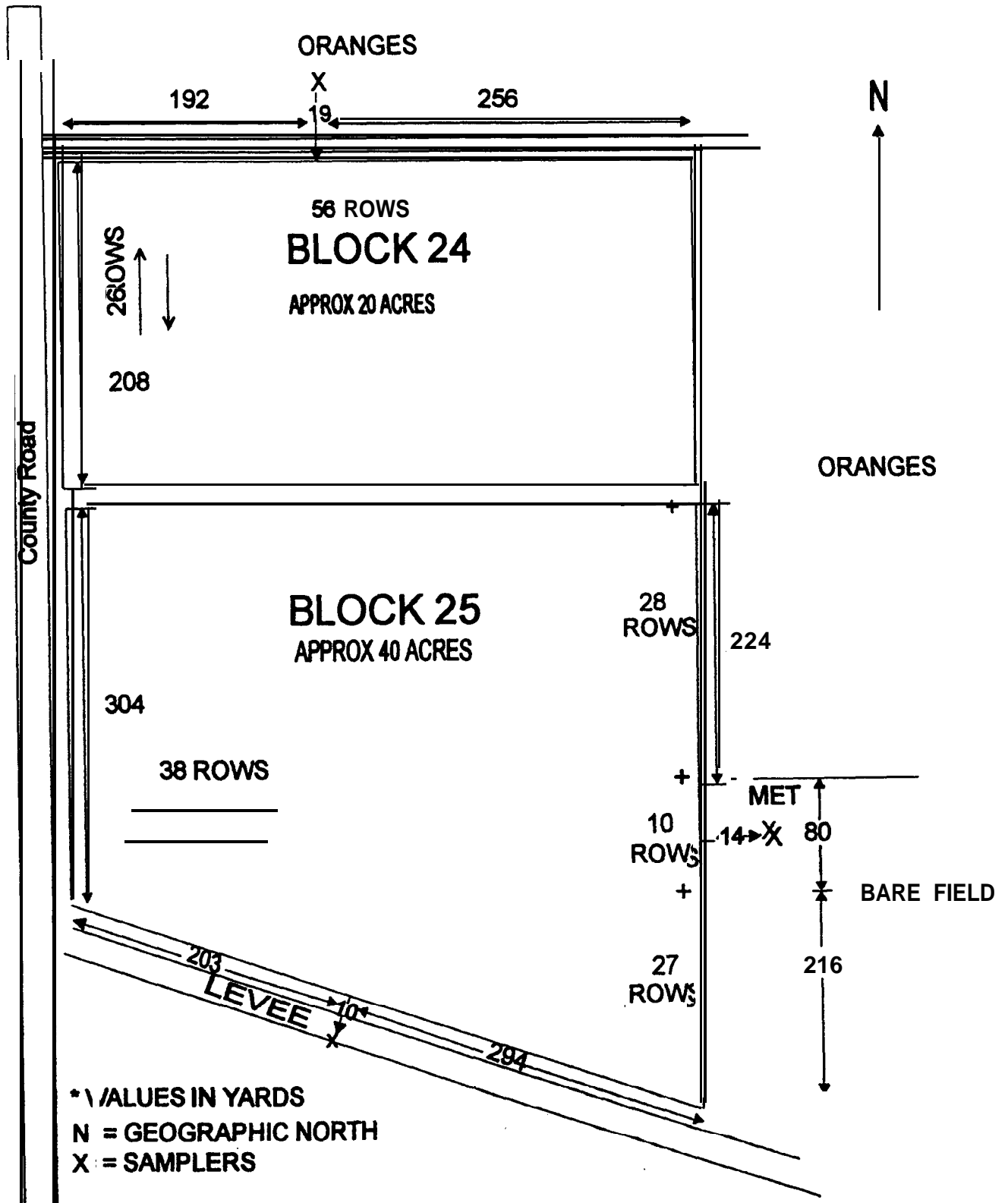
Referring to Appendix II (appendices pg. 55), laboratory resin blank analyses showed contamination for chlorpyrifos (no contamination was found for chlorpyrifos **oxon**) during analyses on 6/14/96 and 6/21/96. The contamination is suspected to have originated during spiking of cartridges for QMOSB lab, trip and field spikes on 6/11/96. Sample cartridges prepared, using the contaminated resin, for ambient use the week of 6/17/96 were recalled and new sample cartridges prepared using a new resin lot showing no contamination. No actual ambient samples were affected by the contamination problem (i.e., no contaminated resin was used for sampling). Note that all ambient and application trip blank results were less than the **LOQ** of 0.20 **ug/sample** for chlorpyrifos and chlorpyrifos **oxon**.

# FIGURE 1. CHLORPYRIFOS AMBIENT MONITORING AREA



# FIGURE 2

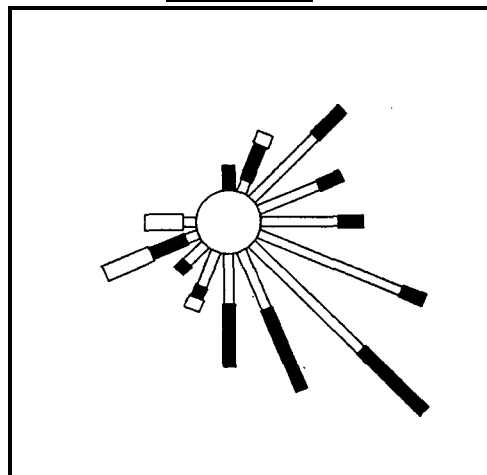
## CHLORPYRIFOS APPLICATION SITE



# FIGURE 3. CHLORPYRIFOS APPLICATION DATA (ug/m3)

BACKGROUND  
9 Hours

0.69

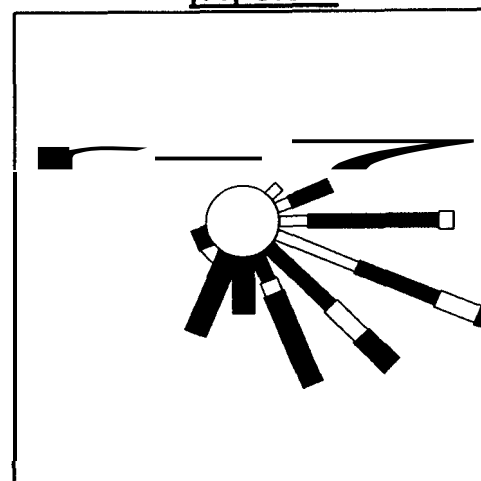


1.57

2.07

PERIOD 1  
5.5 Hours

[N] 8.58

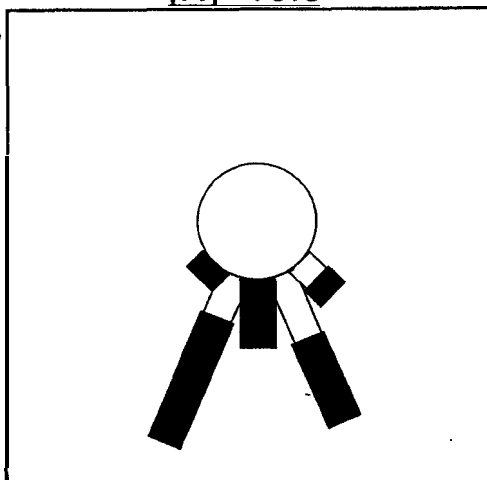


10.5

[S] 25.4

PERIOD 2  
1.75 Hours

[N] 10.3

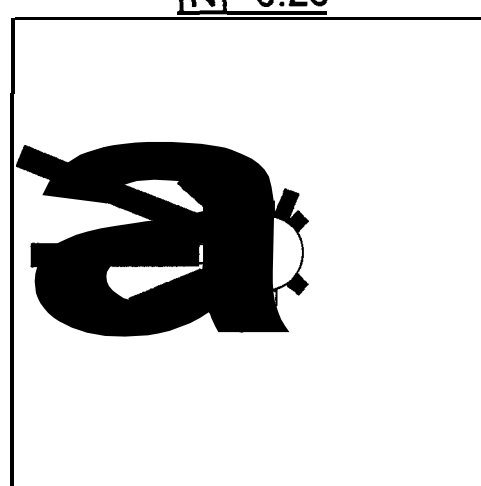


30.9

[S] 0.16

PERIOD 3  
4.25 Hours

[N] 0.25

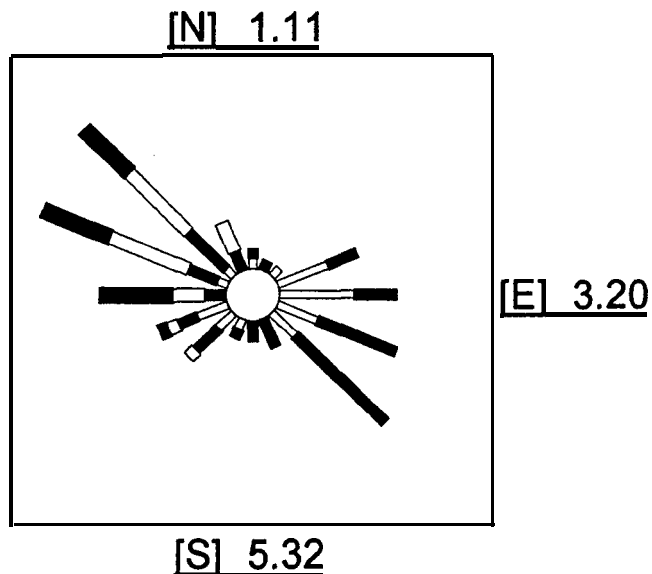


[E] 2.68

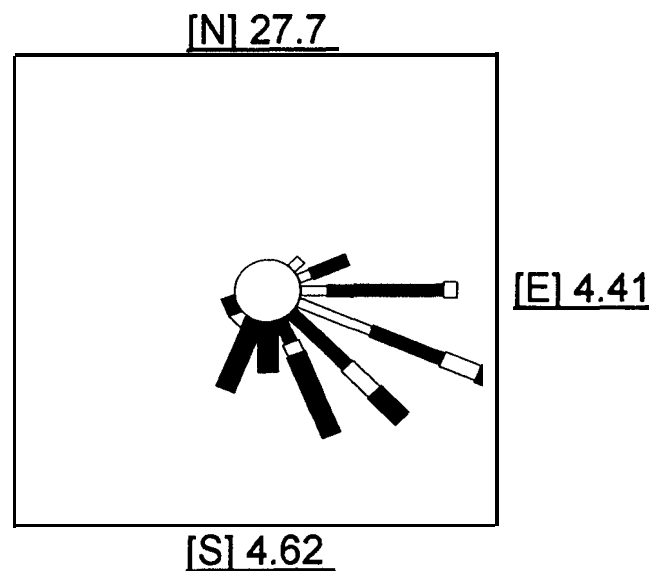
[S] 0.51

# FIGURE 3. CHLORPYRIFOS APPLICATION DATA (ug/m3)

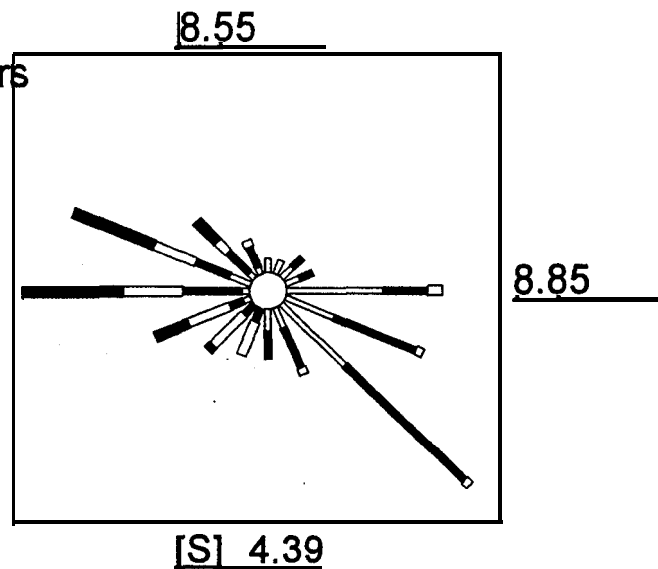
PERIOD 4  
8.5 Hours



PERIOD 5  
8.5 Hours



PERIOD 6  
17.25 Hours



PERIOD 7  
24 Hours

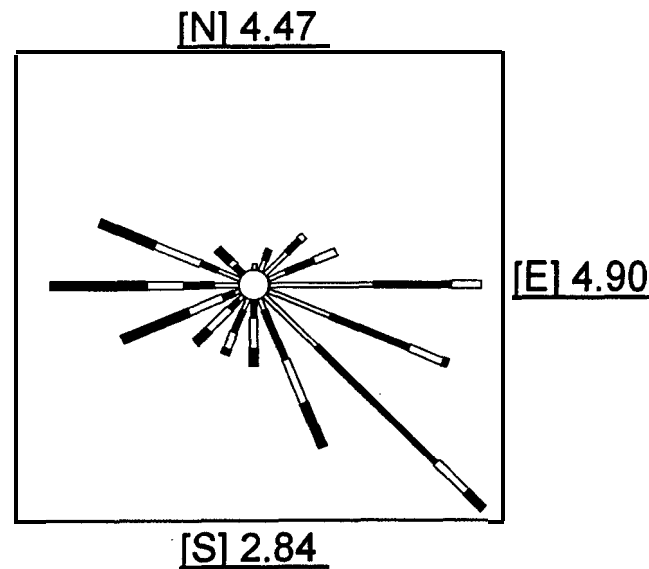


TABLE 4

Chlorpyrifos and Chlorpyrifos Oxon  
Application Site Results

Log #	Sample I.D.	Sample Start Date/Time	Sample End Date/Time	Total Sample Time (min.)	Total Sample Volume (m <sup>3</sup> )	Chlorpyrifos		Chlorpyrifos Oxon	
						(ug/m <sup>3</sup> )	ppbv	(ug/m <sup>3</sup> )	ppbv
1	E-1	6/3/96 2 120	6/4/96 0555	515	7.47	1.57	0.110	0.08	0.006
3	S-1	6/3/96 2110	6/4/96 0540	510	7.40	2.07	0.144	0.11	0.008
5	N-1	6/3/96 2125	6/4/96 0605	520	7.54	0.69	0.048	0.03	0.002
6	s-2	6/4/96 0550	6/4/96 1130	340	4.93	25.4	1.77	1.41	0.103
7	E-2	6/4/96 0555	6/4/96 1135	340	4.93	8.60	0.600	0.39	0.028
8	E-2D	6/4/96 0555	6/4/96 1135	340	4.93	12.4	0.865	0.76	0.056
9	N-2	6/4/96 0610	6/4/96 1125	375	5.44	8.58	0.599	0.61	0.045
10	s-3	6/4/96 1130	6/4/96 13 15	105	1.52	0.16	0.011	0.14	0.010
11	E-3	6/4/96 1135	6/4/96 13 15	100	1.45	14.7	1.03	1.76	0.129
12	E-3D	6/4/96 1135	6/4/96 13 15	100	1.45	47.2	3.29	3.01	0.219
13	N-3	6/4/96 1125	6/4/96 13 10	105	1.52	10.3	0.719	1.61	0.118
14	N-4	6/4/96 1310	6/4/96 1730	260	3.77	0.25	0.174	0.62	0.045
15	s-4	6/4/96 1315	6/4/96 1735	260	3.77	0.51	0.036	0.71	0.052
16	E-4	6/4/96 1320	6/4/96 1740	260	3.77	2.76	0.192	1.85	0.135
17	E-4D	6/4/96 1320	6/4/96 1740	260	3.77	2.60	0.181	1.90	0.139
18	N-5	6/4/96 1730	6/5/96 0400	630	9.14	1.11	0.077	0.11	0.008
19	s-5	6/4/96 1735	6/5/96 0405	630	9.14	5.32	0.371	0.35	0.026
20	E-5	6/4/96 1740	6/5/96 0410	630	9.14	2.19	0.152	0.28	0.021
21	E-5D	6/4/96 1740	6/5/96 04 10	630	9.14	4.21	0.293	0.34	0.025
22	N-6	6/5/96 0400	6/5/96 1235	515	7.47	27.7	1.93	1.50	0.110
23	S-6	6/5/96 0405	6/5/96 1240	515	7.47	4.62	0.322	0.66	0.048
24	E-6	6/5/96 0410	6/5/96 1245	515	7.47	4.47	0.312	0.65	0.048
25	E-6D	6/5/96 0410	6/5/96 1245	515	7.47	4.35	0.303	0.60	0.044
26	N-7	6/5/96 1235	6/6/96 0605	1050	15.2	8.55	0.596	0.57	0.042
27	s-7	6/5/96 1240	6/6/96 06 10	1050	15.2	4.39	0.306	0.37	0.027
28	E-7	6/5/96 1245	6/6/96 06 15	1050	15.2	8.62	0.601	0.95	0.069
29	E-7D	6/5/96 1245	6/6/96 06 15	1050	15.2	9.08	0.633	0.98	0.072
31	N-8	6/6/96 0605	6/7/96 0605	1440	20.9	4.47	0.312	0.88	0.064
32	S-8	6/6/96 06 10	6/7/96 0610	1440	20.9	2.84	0.198	0.41	0.030
33	E-8	6/6/96 0615	6/7/96 0615	1440	20.9	4.88	0.341	0.81	0.059
34	E-8D	6/6/96 0615	6/7/96 0615	1440	20.9	4.93	0.344	0.87	0.064

Table 5

Summary of Application Site  
Chlorpyrifos and Oxon Results

Sampling Period	*East		South		North	
	Chlorpyrifos (ug/m <sup>3</sup> )	Chlorpyrifos Oxon (ug/m <sup>3</sup> )	Chlorpyrifos (ug/m <sup>3</sup> )	Chlorpyrifos Oxon (ug/m <sup>3</sup> )	Chlorpyrifos (ug/m <sup>3</sup> )	Chlorpyrifos Oxon (ug/m <sup>3</sup> )
Background	1.57	0.08	2.07	0.11	0.69	0.03
1	8.60/12.4	0.39/0.76	25.4	1.41	8.58	0.61
2	14.7/47.2	1.76/3.01	0.16	0.14	10.3	1.61
3	2.76/2.60	1.85/1.90	0.51	0.71	0.25	0.62
4	2.19/4.21	0.28/0.34	5.32	0.35	1.11	0.11
5	4.47/4.35	0.65/0.60	<del>4.62</del>	<del>0.66</del>	27.7	1.50
6	8.62/9.08	0.95/0.98	4.39	0.37	8.55	0.57
7	4.88/4.93	0.81/0.87	2.84	0.41	4.47	0.88

. Collocated Site

Table 6

## Application Site Collocated Results

Log #	Sample I. D.	Chlorpyrifos (ug/m <sup>3</sup> )	Chlorpyrifos Oxon (ug/m <sup>3</sup> )	Chlorpyrifos Average (ug/m <sup>3</sup> )	Chlorpyrifos Oxon Average (ug/m <sup>3</sup> )	Chlorpyrifos 'RD	Chlorpyrifos Oxon 'RD
7 8	E2 E2D	8.60 12.4	0.39 0.76	10.5	0.58	36.2%	32.0%
11 12	E3 E3D	14.7 47.2	1.76 3.01	31.0	2.39	105%	52.0%
16 17	E4 E4D	2.76 2.60	1.85 1.90	2.68	1.87	6.00%	2.70%
20 21	E5 E5D	2.19 4.21	0.28 0.34	3.20	0.31	63.0%	19.0%
24 25	E6 E6D	4.47 4.35	0.65 0.60	4.41	0.63	2.70%	7.90%
28 29	E7 E7D	8.62 9.08	0.95 0.98	8.85	0.96	5.20%	3.10%
33 34	E8 E8D	4.88 4.93	0.81 0.87	4.90	0.84	1.10%	7.10%

• RD = Relative Difference  
= (Diff./Ave.) 100



Table 7. Chlorpyrifos and Oxon Ambient Monitoring Results

Log ID	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Volume (m3)	Chlorpyrifos (ug/sample) (ng/m3) *(pptv)			Chlorpyrifos Oxon (ug/sample) (ng/m3) *(pptv)		
1	ARB-01	5/28/96 12:00	5/29/96 11:30	1410	20.7	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
2	J-01	5/28/96 12:30	5/29/96 13:00	1470	21.6	1.63	75.4	5.26	1.07	49.5	3.62
3	s-01	5/28/96 13:00	5/29/96 13:30	1470	21.6	<LOQ	<LOQ	<LOQ	0.36	16.7	1.22
4	K-01	5/28/96 14:00	5/29/96 14:00	1440	21.2	0.81	38.3	2.67	1.47	69.4	5.08
5	UC-01	5/28/96 14:30	5/29/96 14:30	1440	21.21	0.541	25.51	1.781	0.831	39.21	2.87
6	ARB-02	5/29/96 11:30	5/30/96 10:00	1350	19.8	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
7	ARB-	5/29/96 11:30	5/30/96 10:00	1350	19.8	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
8	J-02	5/29/96 13:00	5/30/96 11:00	1320	19.4	1.00	51.5	3.60	0.47	24.2	1.77
9	J-02D	5/29/96 13:00	5/30/96 11:00	1320	19.4	1.00	51.5	3.60	0.45	23.2	1.70
10	S-02	5/29/96 13:30	5/30/96 11:30	1320	19.4	0.41	21.1	1.417	0.23	11.9	0.87
11	S-02D	5/29/96 13:30	5/30/96 11:30	1320	19.4	0.45	23.2	1.62	0.24	12.4	0.90
12	K-02	5/29/96 14:00	5/30/96 12:00	1320	19.4	1.02	52.6	3.67	1.54	79.4	5.80
13	K-02D	5/29/96 14:00	5/30/96 12:00	1320	19.4	1.02	52.6	3.67	1.54	79.4	5.80
14	UC-02	5/29/96 14:30	5/30/96 13:00	1350	19.8	0.83	41.81	2.92	0.49	24.7	1.81
15	UC-02D	5/29/96 14:30	5/30/96 13:00	1350	19.81	0.891	44.81	3.13	0.44	22.2	1.62
16	Blank	5/29/96 14:30	5/29/96 14:30	0	0.0	NR			NR		
17	ARB-03	5/30/96 10:00	5/31/96 11:30	1530	22.5	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
18	J-03	5/30/96 11:00	5/31/96 10:30	1410	20.7	1.37	66.1	4.61	0.32	15.4	1.13
19	s-03	5/30/96 11:30	5/31/96 11:00	1410	20.7	0.66	31.8	2.22	1.81	87.3	6.38
20	K-03	5/30/96 12:00	5/31/96 10:00	1320	19.4	0.78	40.2	2.80	2.60	134	9.80
21	UC-03	5/30/96 13:00	5/31/96 09:30	1230	18.1	1.29	71.3	4.98	0.62	34.3	2.51
23	ARB-04	6/02/96 12:00	6/03/96 11:00	1380	20.3	0.79	38.9	2.72	1.21	59.6	4.36
24	K-04	6/02/96 12:35	6/03/96 12:00	1405	20.7	1.69	81.8	5.71	2.74	133	9.70
25	S-04	6/02/96 13:30	6/03/96 12:30	1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
26	J-04	6/02/96 14:15	6/03/96 12:50	1355	19.91	<LOQ	<LOQ	<LOQ	0.221	11.0	0.811
27	UC-04	6/02/96 15:00	6/03/96 13:30	1350	19.8	0.42	21.2	1.48	1.03	51.9	3.79
28	ARB-05	6/03/96 11:00	6/04/96 10:00	1380	20.3	<LOQ	<LOQ	<LOQ	0.23	11.3	0.83
29	K-05	6/03/96 12:00	6/04/96 10:45	1365	20.1	8.27	412	28.8	4.61	230	16.8
30	S-05	6/03/96 12:30	6/04/96 11:15	1365	20.1	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
31	J-05	6/03/96 12:50	6/04/96 12:00	1390	20.4	<LOQ	<LOQ	<LOQ	0.29	14.2	1.04
32	UC-05	6/03/96 13:30	6/04/96 12:30	1380	20.3	3.40	168	11.7	3.53	174	12.7

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

NR = Not Reported

\*pptv at 25 C and 1 atm

**Table 7. Chlorpyrifos and Oxon Ambient Monitoring Results**

Log ID	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Volume (m3)	Chlorpyrifos (ug/sample)	(ng/m3)	*(pptv)	Chlorpyrifos Oxon (ug/sample)	(ng/m3)	*(pptv)
33	ARB-06	6/04/96 10:00	6/05/96 09:00	1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
34	K-06	6/04/96 10:45	6/05/96 09:45	1380	20.3	2.10	104	7.22	1.75	86.3	6.31
35	S-06	6/04/96 11:15	6/05/96 10:15	1380	20.3	0.30	14.8	1.03	0.45	22.2	1.62
36	J-06	6/04/96 12:00	6/05/96 11:00	1380	20.3	6.30	311	21.7	3.50	173	12.6
37	UC-06	6/04/96 12:30	6/05/96 11:30	1380	20.3	0.68	33.5	2.34	0.47	23.2	1.69
38	ARB-07	6/05/96 09:00	6/06/96 08:00	1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
39	ARB-	6/05/96 09:00	6/06/96 08:00	1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
40	K-07	6/05/96 09:45	6/06/96 08:45	1380	20.3	2.50	123	8.60	1.71	84.3	6.16
41	K-07D	6/05/96 09:45	6/06/96 08:45	1380	20.3	2.40	118	8.25	1.64	80.8	5.91
42	S-07	6/05/96 10:15	6/06/96 09:15	1380	20.3	0.30	14.8	1.03	0.27	13.3	0.97
43	S-07D	6/05/96 10:15	6/06/96 09:15	1380	20.3	0.21	10.4	0.72	0.21	10.4	0.76
44	J-07	6/05/96 11:00	6/06/96 10:00	1380	20.3	8.77	432	30.2	3.04	150	11.0
45A	J-07D	6/05/96 11:00	6/06/96 10:00	1380	20.3	7.891	389	27.11	2.53	125	9.12
46A	UC-07	6/05/96 11:30	6/06/96 10:00	1350	19.8	3.24	163	11.4	1.07	53.9	3.94
47A	UC-07D	6/05/96 11:30	6/06/96 10:00	1350	19.8	3.15	159	11.1	1.06	53.4	3.90
48A	Blank	6/06/96 12:00	6/06/96 12:00	0	0.0	NR			NR		
45B	ARB-08	6/10/96 15:00	6/11/96 11:00	1200	17.6	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
46B	J-08	6/10/96 15:45	6/11/96 12:50	1265	18.6	2.15	116	8.07	1.56	83.9	6.13
47B	S-08	6/10/96 16:00	6/11/96 13:15	1275	18.7	0.64	34.1	2.38	0.86	45.9	3.35
48B	ARB-09	6/11/96 11:00	6/12/96 10:20	1400	20.6	0.46	22.4	1.56	0.20	9.7	0.71
49	J-09	6/11/96 12:50	6/12/96 11:05	1335	19.6	2.52	128	8.96	1.78	90.7	6.63
50	S-09	6/11/96 13:15	6/12/96 11:30	1335	19.6	0.37	18.9	1.32	0.60	30.6	2.24
51	K-09	6/11/96 13:45	6/12/96 12:10	1345	19.8	0.92	46.5	3.25	1.38	69.8	5.10
52	UC-09	6/11/96 14:05	6/12/96 12:45	1360	20.0	0.70	35.0	2.44	0.92	46.0	3.36
53	ARB-10	6/12/96 10:20	6/13/96 09:00	1360	20.0	0.31	15.5	1.08	<LOQ	<LOQ	<LOQ
54	ARB-	6/12/96 10:20	6/13/96 09:00	1360	20.0	0.57	28.5	1.99	<LOQ	<LOQ	<LOQ
55	J-10	6/12/96 11:05	6/13/96 09:40	1355	19.9	3.29	165	11.52	1.10	55.2	4.04
56	J-10D	6/12/96 11:05	6/13/96 09:40	1355	19.9	3.36	169	11.77	1.10	55.2	4.04
57	S-10	6/12/96 11:30	6/13/96 10:05	1355	19.9	0.76	38.2	2.66	0.79	39.7	2.90
58	S-10D	6/12/96 11:30	6/13/96 10:05	1355	19.9	0.83	41.7	2.91	0.77	38.7	2.83
59	K-10	6/12/96 12:10	6/13/96 10:45	1355	19.9	1.61	80.8	5.64	1.12	56.2	4.11

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

NR = Not Reported

\*pptv at 25 C and 1 atm

Table 7. Chlorpyrifos and Oxon Ambient Monitorina Results

Log ID	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Volume (m3)	Chlorpyrifos (ug/sample) (ng/m3) *(pptv)			Chlorpyrifos Oxon (ug/sample) (ng/m3) *(pptv)		
60	K-10D	6/12/96 12:10	6/13/96 10:45	1355	19.9	1.41	70.8	4.94	0.98	49.2	3.60
61	UC-10	6/12/96 12:45	6/13/96 11:20	1355	19.9	0.89	44.7	3.12	0.68	34.1	2.50
62	UC-10D	6/12/96 12:45	6/13/96 11:20	1355	19.9	0.74	37.2	2.59	0.74	37.2	2.72
63	ARB-11	6/13/96 09:00	6/14/96 08:35	1415	20.8	0.46	22.1	1.54	<LOQ	<LOQ	<LOQ
64	J-11	6/13/96 09:40	6/14/96 07:25	1305	19.2	1.75	91.2	6.36	0.51	26.6	1.94
65	S-11	6/13/96 10:05	6/14/96 07:05	1260	18.5	15.1	815	56.9	1.67	90.2	6.59
66	K-11	6/13/96 10:45	6/14/96 07:45	1260	18.5	0.62	33.5	2.34	0.25	13.5	0.99
67	UC-11	6/13/96 11:20	6/14/96 08:05	1245	18.3	0.45	24.6	1.72	0.45	24.6	1.80
68	Blank	6/14/96 08:05	6/14/96 08:05	0	0.0	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
69	ARB-12	6/16/96 12:15	6/17/96 11:00	1365	20.1	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
71	K-12	6/16/96 13:30	6/17/96 12:00	1350	19.8	1.48	74.6	5.20	0.54	27.2	1.99
72	S-12	6/16/96 14:00	6/17/96 12:45	1365	20.1	0.47	23.4	1.63	0.27	13.5	0.98
73	J-12	6/16/96 14:30	6/17/96 13:15	1365	20.1	0.39	19.4	1.36	<LOQ	<LOQ	<LOQ
74	UC-12	6/16/96 15:00	6/17/96 14:00	1380	20.3	<LOQ	<LOQ	<LOQ	0.37	18.2	1.33
75	ARB-13	6/17/96 11:00	6/18/96 10:00	1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
77	K-13	6/17/96 12:00	6/18/96 11:00	1380	20.3	1.84	90.7	6.33	0.61	30.1	2.20
78	S-13	6/17/96 12:45	6/18/96 11:40	1375	20.2	0.52	25.7	1.79	0.27	13.4	0.98
79	J-13	6/17/96 13:10	6/18/96 12:15	13851	20.41	0.391	19.21	1.34	<LOQ	<LOQ	<LOQ
80	UC-13	6/17/96 14:00	6/18/96 13:00	1380	20.3	<LOQ	<LOQ	<LOQ	0.33	16.3	1.19
81	ARB-14	6/18/96 10:00	6/19/96 09:00	1380	20.3	0.20	9.9	0.69	<LOQ	<LOQ	<LOQ
82	ARB-	6/18/96 10:00	6/19/96 09:00	1380	20.3	0.46	22.7	1.58	0.34	16.8	1.23
84	K-14	6/18/96 11:00	6/19/96 09:30	1350	19.8	1.10	55.4	3.87	0.68	34.3	2.50
85	S-14	6/18/96 11:40	6/19/96 10:05	1345	19.8	0.69	34.9	2.43	0.36	18.2	1.33
86	J-14	6/18/96 12:15	6/19/96 10:30	1335	19.61	1.071	54.51	3.80	0.46	23.4	1.71
87	UC-14	6/18/96 13:00	6/19/96 11:00	1320	19.41	0.451	23.21	1.62	0.21	10.8	0.79
88	ARB-15	6/19/96 09:00	6/20/96 08:00	1380	20.3	<LOQ	<LOQ	<LOQ	0.24	11.8	0.86
91	K-15	6/19/96 09:40	6/20/96 09:00	1400	20.6	0.69	33.5	2.34	0.81	39.4	2.88
92	K-15D	6/19/96 09:40	6/20/96 09:00	1400	20.6	0.69	33.5	2.34	0.71	34.5	2.52
93	S-15	6/19/96 10:20	6/20/96 09:40	1400	20.6	0.69	33.0	2.31	0.46	22.4	1.63
94	S-15D	6/19/96 10:20	6/20/96 09:40	1400	20.61	0.721	35.01	2.44	0.45	21.9	1.60
95	J-15	6/19/96 11:10	6/20/96 10:20	13901	20.41	0.801	39.21	2.73	0.72	35.2	2.58

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

NR = Not Reported

● pptv at 25 C and 1 atm

Table 7. Chlorpyrifos and Oxon Ambient Monitoring Results

Log ID	Sample ID	Start Date/Time	End Date/Time	Sample Time	Sample Volume (min.)	Sample Volume (m3)	Chlorpyrifos (ug/sample)	Chlorpyrifos (ng/m3)	Chlorpyrifos *(pptv)	Chlorpyrifos Oxon (ug/sample)	Chlorpyrifos Oxon (ng/m3)	Chlorpyrifos Oxon *(pptv)
96	J-15D	6/19/96 11:10	6/20/96 10:20		1390	20.4	1.00	51.4	3.59	0.931	45.51	3.33
97	UC-15	6/19/96 12:00	6/20/96 11:45		1425	20.91	<LOQ	<LOQ	<LOQ	0.371	17.71	1.29
98	UC-15D	6/19/96 12:00	6/20/96 11:45		1425	20.9	0.44	21.0	1.47	0.32	15.3	1.12
99	Blank	6/20/96 11:45	6/20/96 11:45		0	0.0	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
105	ARB-16	6/24/96 12:00	6/25/96 11:00		1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
107	K-16	6/24/96 12:45	6/25/96 11:45		1380	20.3	0.32	15.8	1.10	<LOQ	<LOQ	<LOQ
108	S-16	6/24/96 13:15	6/25/96 12:15		1380	20.31	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
109	J-16	6/24/96 14:00	6/25/96 13:00		1380	20.31	0.321	15.81	1.101	<LOQ	<LOQ	<LOQ
110	UC-16	6/24/96 14:35	6/25/96 13:30		1375	20.2	0.20	11.4	0.70	<LOQ	<LOQ	<LOQ
111	ARB-17	6/25/96 11:00	6/26/96 10:00		13801	20.31	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
113	K-17	6/25/96 11:35	6/26/96 10:40		1385	20.41	0.861	42.21	2.951	0.59	29.0	2.12
114	S-17	6/25/96 12:05	6/26/96 11:10		1385	20.4	0.60	29.5	2.06	0.32	15.7	1.15
115	J-17	6/25/96 12:30	6/26/96 11:30		1380	20.3	0.79	38.9	2.72	0.46	22.7	1.66
116	UC-17	6/25/96 13:45	6/26/96 12:35		1370	20.1	0.30	14.9	1.04	0.23	11.4	0.83
117	ARB-18	6/26/96 10:00	6/27/96 09:10		1390	20.4	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
118	ARB-	6/26/96 10:00	6/27/96 09:10		1390	20.4	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
120	K-18	6/26/96 10:40	6/27/96 09:50		1390	20.4	0.65	31.6	2.22	<LOQ	<LOQ	<LOQ
121	K-18D	6/26/96 10:40	6/27/96 09:50		1390	20.4	0.61	29.9	2.08	0.24	11.7	0.86
122	S-18	6/26/96 11:10	6/27/96 10:30		1400	20.6	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
123	S-18D	6/26/96 11:10	6/27/96 10:30		1400	20.6	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
124	J-18	6/26/96 11:30	6/27/96 11:00		1410	20.7	0.74	35.7	2.49	0.22	10.6	0.78
125	J-18D	6/26/96 11:30	6/27/96 11:00		1410	20.7	0.64	30.9	2.15	0.21	10.1	0.74
126	UC-18	6/26/96 12:35	6/27/96 11:35		1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
127	UC-18D	6/26/96 12:35	6/27/96 11:35		1380	20.3	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
128	ARB-19	6/27/96 09:10	6/28/96 11:15		1565	23.0	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
130	K-19	6/27/96 09:50	6/28/96 08:30		1360	20.0	0.31	15.5	1.08	<LOQ	<LOQ	<LOQ
131	s-19	6/27/96 10:30	6/28/96 09:00		1350	19.8	1.03	51.9	3.62	0.33	16.6	1.22
132	J-19	6/27/96 11:00	6/28/96 09:25		1345	19.8	1.02	51.6	3.60	0.49	24.8	1.81
133	UC-19	6/27/96 11:35	6/28/96 10:15		1360	20.0	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
134	ARB-20	6/28/96 11:15	6/29/96 09:30		1335	19.6	<LOQ	<LOQ	<LOQ	0.21	10.7	0.78
136	K-20	6/28/96 08:30	6/29/96 10:20		1550	22.8	0.69	30.3	2.11	0.70	30.7	2.25

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

NR = Not Reported

\*pptv at 25 C and 1 atm

**Table 7. Chlorpyrifos and Oxon Ambient Monitoring Results**

Log ID	Sample ID	Start Date/Time	End Date/Time	Sample Time (min.)	Sample Volume (m3)	Chlorpyrifos (ug/sample) (ng/m3) *(pptv)			Chlorpyrifos Oxon (ug/sample) (ng/m3) *(pptv)		
137	s-20	6/28/96 09:00	6/29/96 11:00	1560	22.9	0.48	20.9	1.46	0.32	14.0	1.02
138	J-20	6/28/96 09:25	6/29/96 11:30	1565	23.0	0.65	28.3	1.97	0.50	21.7	1.59
139	UC-20	6/28/96 10:15	6/29/96 12:10	1555	22.9	0.24	10.5	0.73	0.32	14.0	1.02
140	ARB-21	6/29/96 09:30	6/30/96 12:10	1600	23.5	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
141	K-21	6/29/96 10:20	6/30/96 10:10	1430	21.0	0.29	13.8	0.96	<LOQ	<LOQ	<LOQ
142	S-21	6/29/96 11:00	6/30/96 10:40	1420	20.9	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
143	J-21	6/29/96 11:30	6/30/96 11:10	1420	20.9	0.28	13.4	0.94	0.20	9.58	0.70
144	UC-21	6/29/96 12:10	6/30/96 09:30	1280	18.8	<LOQ	<LOQ	<LOQ	0.29	15.4	1.13

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

NR = Not Reported

\*pptv at 25 C and 1 atm

Table 8. Summary of Chlorpyrifos and Oxon Ambient Results (ng/m3)

Start Date	ARB		J		K		S		UC	
	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon
5/28/96	<LOQ	<LOQ	75.4	49.5	41.1	69.4	<LOQ	16.7	25.5	39.2
5/29/96	<LOQ	<LOQ	51.5	24.2	52.6	79.4	21.1	11.9	41.8	24.7
5/29/96	<LOQ	<LOQ	51.5	23.2	79.9	51.0	23.2	12.4	44.8	22.2
5/30/96	<LOQ	<LOQ	66.1	15.4	40.2	134	31.8	87.3	71.3	34.3
6/02/96	38.9	59.6	<LOQ	11.0	81.8	133	<LOQ	<LOQ	21.2	51.9
6/03/96	<LOQ	11.3	<LOQ	14.2	412	230	<LOQ	<LOQ	168	174
6/04/96	<LOQ	<LOQ	311	173	104	86.3	14.8	22.2	33.5	23.2
6/05/96	<LOQ	<LOQ	432	150	123	84.3	14.8	13.3	163	53.9
6/05/96	<LOQ	<LOQ	389	125	118	80.8	10.4	10.4	159	53.4
6/10/96	<LOQ	<LOQ	116	83.9			34.1	45.9		
6/11/96	22.4	9.7	128	90.7	46.5	69.8	18.9	30.6	35.0	46.0
6/12/96	15.5	<LOQ	165	55.2	80.8	56.2	38.2	39.7	44.7	34.1
6/12/96	28.5	<LOQ	169	55.2	70.8	49.2	41.7	38.7	37.2	37.2
6/13/96	22.1	<LOQ	91.2	26.6	33.5	13.5	815	90.2	24.6	24.6
6/16/96	<LOQ	<LOQ	19.4	<LOQ	74.6	27.2	23.4	13.5	<LOQ	18.2
6/17/96	<LOQ	<LOQ	19.2	<LOQ	90.7	30.1	25.7	13.4	<LOQ	16.3
6/18/96	9.9	<LOQ	54.5	23.4	55.4	34.3	34.9	18.2	23.2	10.8
6/18/96	22.7	16.8	39.2	35.2	33.5	39.4	33.0	22.4	<LOQ	17.7
6/19/96	<LOQ	11.8	51.4	45.5	33.5	34.5	35.0	21.9	21.0	15.3
6/24/96	<LOQ	<LOQ	15.8	<LOQ	15.8	<LOQ	<LOQ	<LOQ	11.4	<LOQ
6/25/96	<LOQ	<LOQ	38.9	22.7	42.2	29.0	29.5	15.7	14.9	11.4
6/26/96	<LOQ	<LOQ	35.7	10.6	31.8	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
6/26/96	<LOQ	<LOQ	30.9	10.1	29.9	11.7	<LOQ	<LOQ	<LOQ	<LOQ
6/27/96	<LOQ	<LOQ	51.6	24.8	15.5	<LOQ	51.9	16.6	<LOQ	<LOQ
6/28/96	<LOQ	10.7	28.3	21.7	30.3	30.7	20.9	14.0	10.5	14.0
6/29/96	<LOQ	<LOQ	13.4	9.6	13.8	<LOQ	<LOQ	<LOQ	<LOQ	15.4
Maximum	38.9	59.6	432	173	412	230	815	90.2	168	174
Mean	26.9	20.0	93.1	48.0	72.3	68.1	81.0	29.7	47.5	36.3
# samples	21	21	21	21	20	20	21	21	20	20
# > LOQ	5	6	19	18	20	17	15	16	15	17

only the higher value of each collocated pair was used for the above statistics; values <LOQ were not used to calculate the mean

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

Table 9. Chlorpyrifos and Oxon Ambient Collocated Results

Log #	Sample ID	Start Date/Time	End Date/Time	(ng/m3)		Average (ng/m3)		RD*	
				Chlorpyrifos	Oxon	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon
6	ARB-2	5/29/96 11:30	5/30/96 10:00	<LOQ	<LOQ				
7	ARB-2D	5/29/96 11:30	5/30/96 10:00	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
8	J-2	5/29/96 13:00	5/30/96 11:00	51.5	24.2				
9	J-2D	5/29/96 13:00	5/30/96 11:00	51.5	23.2	51.5	23.7	0.00%	4.35%
10	S-2	5/29/96 13:30	5/30/96 11:30	21.1	11.9				
11	S-2D	5/29/96 13:30	5/30/96 11:30	23.2	12.4	22.2	12.1	9.30%	4.26%
12	K-2	5/29/96 14:00	5/30/96 12:00	52.6	79.4				
13	K-2D	5/29/96 14:00	5/30/96 12:00	79.9	51.0	66.2	65.2	41.2%	43.5%
14	UC-2	5/29/96 14:30	5/30/96 13:00	41.8	24.7				
15	UC-2D	5/29/96 14:30	5/30/96 13:00	44.8	22.2	43.3	23.4	6.98%	10.8%
38	ARB-7	6/5/96 9:00	6/6/96 8:00	<LOQ	<LOQ				
39	ARB-7D	6/5/96 9:00	6/6/96 8:00	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
40	K-7	6/5/96 9:45	6/6/96 8:45	123	84.3				
41	K-7D	6/5/96 9:45	6/6/96 8:45	118	80.8	121	82.6	4.08%	4.18%
42	S-7	6/5/96 10:15	6/6/96 9:15	14.8	13.3				
43	S-7D	6/5/96 10:15	6/6/96 9:15	10.4	10.4	12.6	11.8	35.3%	25.0%
44	J-7	6/5/96 11:00	6/6/96 10:00	432	150				
45A	J-7D	6/5/96 11:00	6/6/96 10:00	389	125	411	137	10.6%	18.3%
46A	UC-7	6/5/96 11:30	6/6/96 10:00	163	53.9				
47A	UC-7D	6/5/96 11:30	6/6/96 10:00	159	53.4	161	53.7	2.82%	0.94%

● RD = Relative Difference = (Diff./Ave.)100

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

Table 9. Chlorpyrifos and Oxon Ambient Collocated Results

Log	Sample # ID	start Date/Time	End Date/Time	(ng/m3)		Average (ng/m3)		RD*	
				Chlorpyrifos	Oxon	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon
53	ARB-10	6/12/96 10:20	6/13/96 9:00	15.5	<LOQ				
54	ARB-10D	6/12/96 10:20	6/13/96 9:00	28.5	<LOQ	22.01	<LOQ	59.1%	<LOQ
55	J-10	6/12/96 11:05	6/13/96 9:40	165	55.2				
56	J-10D	6/12/96 11:05	6/13/96 9:40	169	55.2	167	55.2	2.11%	0.00%
57	s-10	6/12/96 11:30	6/13/96 10:05	38.2	39.7				
58	S-10D	6/12/96 11:30	6/13/96 10:05	41.7	38.7	39.9	39.2	8.81%	2.56%
59	K-10	6/12/96 12:10	6/13/96 10:45	80.81	56.2				
60	K-10D	6/12/96 12:10	6/13/96 10:45	70.8	49.2	75.8	52.7	13.2%	13.33%
61	UC-10	6/12/96 12:45	6/13/96 11:20	44.7	34.1				
62	UC-10D	6/12/96 12:45	6/13/96 11:20	37.2	37.2	40.9	35.6	18.4%	8.45%
81	ARB-14	6/18/96 10:00	6/19/96 9:00	9.9	<LOQ				
82	ARB-14D	6/18/96 10:00	6/19/96 9:00	22.7	16.8	16.3	<LOQ	78.79%	<LOQ
91	K-15	6/19/96 9:40	6/20/96 9:00	33.5	39.4				
92	K-15D	6/19/96 9:40	6/20/96 9:00	33.5	34.5	33.5	36.9	0.00%	13.16%
93	S-15	6/19/96 10:20	6/20/96 9:40	33.0	22.4				
94	S-15D	6/19/96 10:20	6/20/96 9:40	35.0	21.9	34.0	22.1	5.71%	2.20%
95	J-15	6/19/96 11:10	6/20/96 10:20	39.2	35.2				
96	J-15D	6/19/96 11:10	6/20/96 10:20	51.4	45.5	45.31	40.4	27.0%	25.5%
97	U C - 15	6/19/96 12:00	6/20/96 11:45	<LOQ	17.7				
98	UC-15D	6/19/96 12:00	6/20/96 11:45	21.0	15.3	<LOQ	16.5	<LOQ	14.49%

● RD = Relative Difference = (Diff./Ave.)100

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon



Table 9. Chlorpyrifos and Oxon Ambient Collocated Results

Log	Sample # ID	Start Date/Time	End Date/Time	(ng/m3)		Average (ng/m3)		RD*	
				Chlorpyrifos	Oxon	Chlorpyrifos	Oxon	Chlorpyrifos	Oxon
117	ARB-18	6/26/96 10:00	6/27/96 9:10	<LOQ	<LOQ				
118	ARB-18D	6/26/96 10:00	6/27/96 9:10	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
120	K-18	6/26/96 10:40	6/27/96 9:50	31.8	<LOQ				
121	K-18D	6/26/96 10:40	6/27/96 9:50	29.9	11.7	30.81	<LOQ	6.35%	<LOQ
122	S-18	6/26/96 11:10	6/27/96 10:30	<LOQ	<LOQ				
123	S-18D	6/26/96 11:10	6/27/96 10:30	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
124	J-18	6/26/96 11:30	6/27/96 11:00	35.7	10.6				
125	J-18D	6/26/96 11:30	6/27/96 11:00	30.9	10.1	33.31	10.4	14.5%	4.65%
126	UC-18	6/26/96 12:35	6/27/96 11:35	<LOQ	<LOQ				
127	UC-18D	6/26/96 12:35	6/27/96 11:35	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ

● RD=Relative Difference=(Diff./Ave.)100

LOQ = 0.20 ug per sample for Chlorpyrifos and Chlorpyrifos Oxon

Table 10. Chlorpyrifos and Oxon Ambient *Laboratory* Spike Results

Sample ID	Date Analyzed	Chlorpyrifos Mass (ug)	Expected Mass (ug)	Percent Recovery	Oxon Mass (ug)	Expected Mass (ug)	Percent Recovery
QA-1L	7/22/96	5.82	5.00	116%	2.80	2.50	112%
QA-2L	7/22/96	1.08	1.00	108%	<0.20	0.00	NA
QA-3L	7/22/96	5.41	5.00	108%	3.01	2.50	120%
QA-4L	7/22/96	1.01	1.00	101%	<0.20	0.00	NA
QA-5L	7/22/96	<0.20	0.00	NA	<0.20	0.00	NA
QA-6L	7/22/96	10.4	10.0	104%	<0.20	0.00	NA
QA-7L	7/22/96	9.95	10.0	100%	5.51	5.00	110%
QA-8L	7/22/96	23.5	25.0	94%	4.94	5.00	98.8%
QA-9L	7/22/96	24.6	25.0	98%	10.7	10.0	107%
QA-10L	7/22/96	51.0	50.0	102%	53.7	50.0	107%

\*Prepared by QMOSB staff on 7/19/96.

Table 11. Chlorpyrifos and Oxon Application *Trip* Spike Results

Sample ID	Date Analyzed	Chlorpyrifos Mass (ug)	Expected Mass (ug)	Percent Recovery	Oxon Mass (ug)	Expected Mass (ug)	Percent Recovery
S040-01	6/7/96	491	500	98.2%	**0.21	0.00	NA
S040-02	6/7/96	247	250	98.8%	25.7	25.0	103%
S040-03	6/7/96	98.7	100	98.7%	96.2	100	96.2%
S040-04	6/7/96	<0.20	0.00	NA	245	250	98.0%

\*Prepared by ELB staff on 6/3/96.

\*\*Oxon residue is probably due to a trace amount of the oxon in the chlorpyrifos standard.

Table 12. Chlorpyrifos (no oxon) Ambient *Field* Spike Results

Sample ID	Date Analyzed	Chlorpyrifos Mass (ug)	Expected Mass (ug)	Percent Recovery	Oxon Mass (ug)	Expected Mass (ug)	Percent Conversion
FAUCD-1	6/28/96	45.4	50.0	90.8%	1.20	0.00	2.4%
FAUCD-2	6/28/96	52.0	50.0	104%	0.70	0.00	1.4%
FAUCD-3	6/28/96	47.1	50.0	94.2%	0.50	0.00	1.0%
FAUCD-4	6/28/96	45.1	50.0	90.2%	2.00	0.00	4.0%
FAUCD-5	7/2/96	46.5	50.0	93.0%	1.10	0.00	2.2%

\*Prepared by UCD-TAL staff on 6/20/96.